How energy-efficient is your cloud app?

Mascha Kurpicz, Maxime Colmant, Loïc Huertas, Anita Sobe, Pascal Felber, Romain Rouvoy

PARA DIME

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Energy measurements in virtualized environments with PowerAPI

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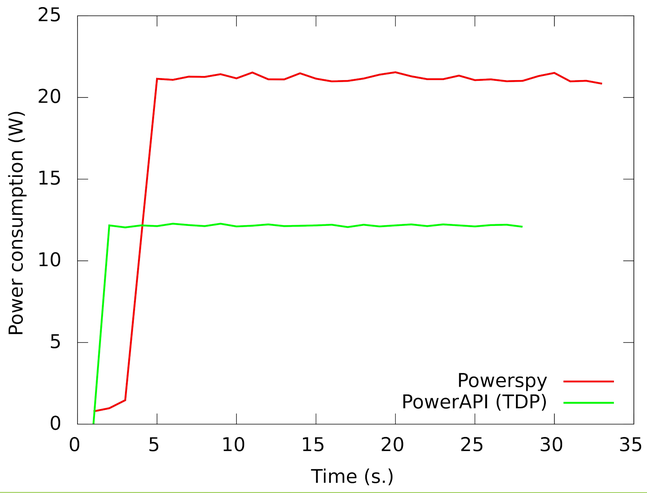
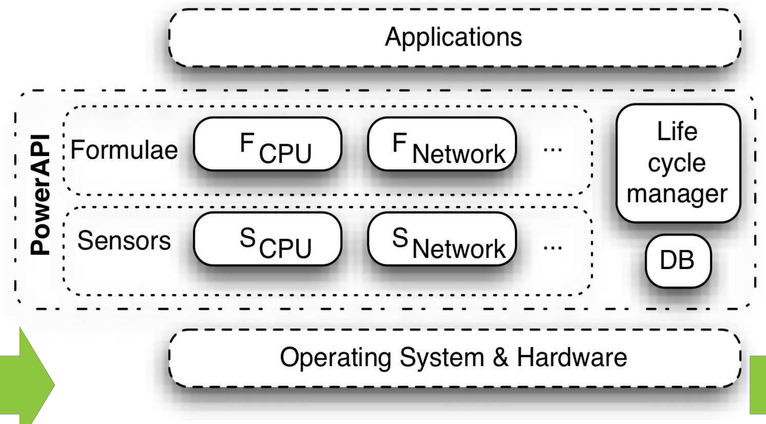
Context

- Energy-efficiency major concern in data centers
- Existing approaches work for physical servers, not virtualized environments

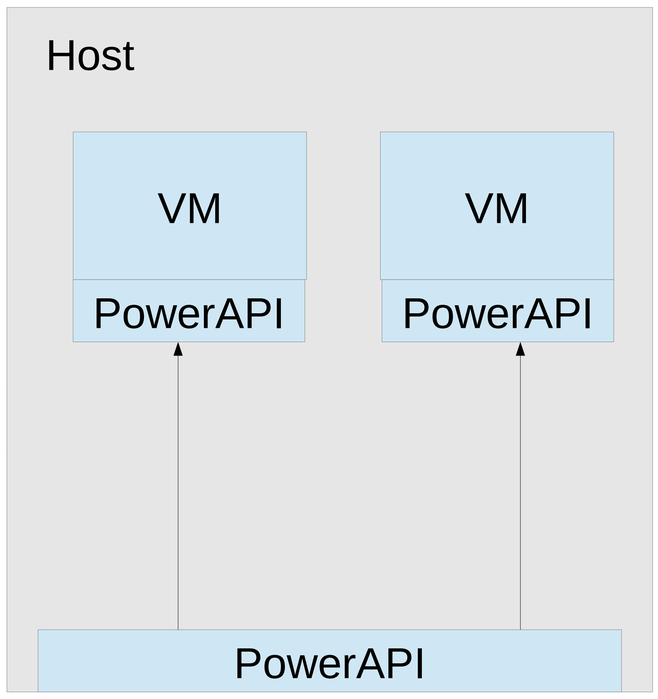


PowerAPI



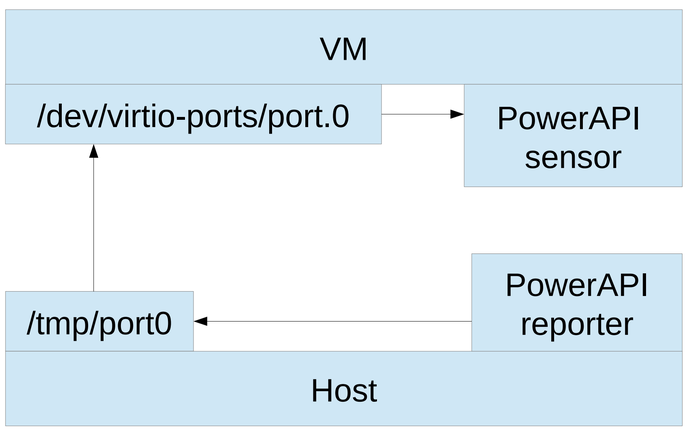
- Scala-based (Akka)
- Process-level
- Modular, asynchronous event-driven architecture

Idea



Methods

Communication with VirtioSerial



Formula in the host

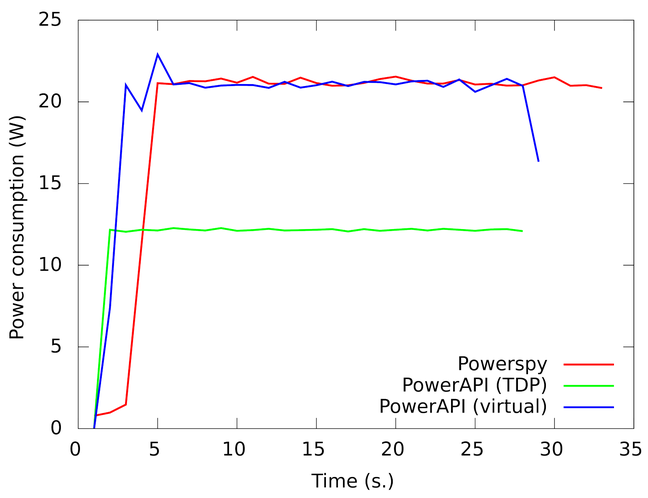
- CPU power consumption not linear to utilization
  - Hyper-threading
  - Turbo-boost
  - DVFS
- Hardware specific
- Determine the formula by polynomial regression with the help of a power meter

Formula in the VM

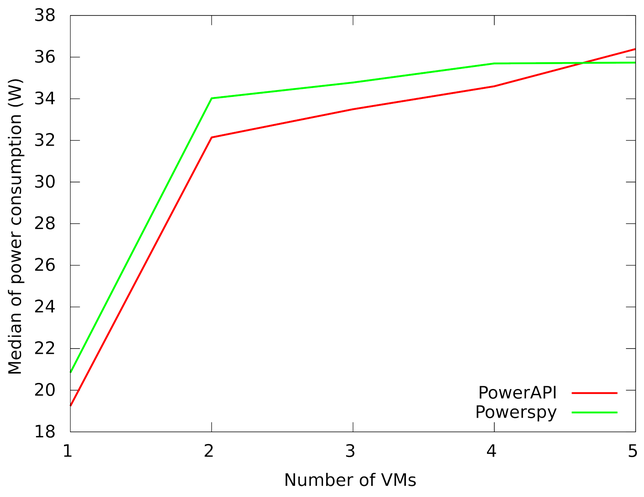
$$P(App) = \frac{P(VM) * U(App)}{U(all\,VM)}$$

- Host reports power of the VM
- VM computes process-level power

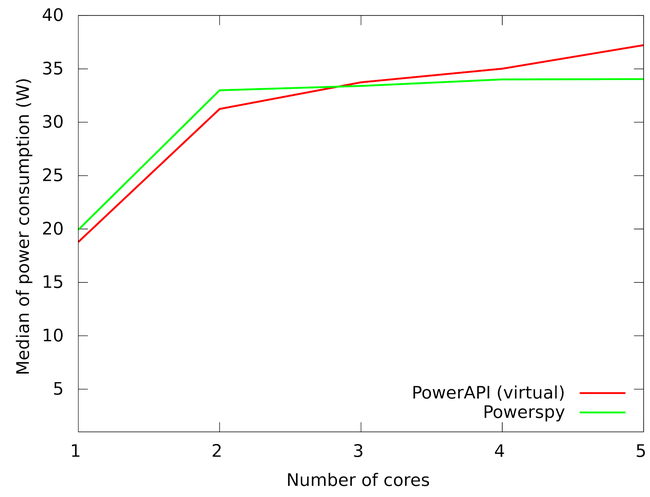
Evaluation



1 VM, 2 cores, load on 1 core



1-5 VMs, 1 core each, load on 1 core



1 VM, 1-5 cores, load on all cores available to the VM

Conclusion

Provide tool to estimate process-level power consumption in virtualized environments

Measurements are first step towards energy-efficient data centers

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